OUR BOOKSHELF.

Studies in Insect Life, and Other Essays. By Dr. A. E. Shipley. Pp. ix+338. (London: T. Fisher Unwin, Ltd., 1917.) Price 10*s.* 6*d.* net.

IT is Dr. Shipley's gift to write scientific essays artistically, using many-coloured lights from reading and experience to illumine and humanise hard grey facts. He has humour and a light touch, and things are so interesting to himself that they become interesting to us. Not that we pretend to explain his style, which permits of luminous, dignified discourse on lice and fleas, as well as on fisheries and grouse. "Le style," said Buffon, "est comme le bonheur; il vient de la douceur de l'âme."

The book, based on previously published essays and lectures, has eleven chapters, dealing with insects and war, honey-bees, humble-bees, wasps, the depths of the sea, fisheries, Sir John Murray, grouse-disease, zoology in the time of Shakespeare, the revival of science in the seventeenth century, and hate. We have seen no more successful rapidly drawn picture of a haunt of life than is to be found in the chapter on "The Romance of the Depths of the Sea." Another fine picture of a very different kind is that of Sir John Murray. It is very interesting to have Dr. Shipley's lively summary of his own investigations on what is called "grouse-disease," of which, adapting Sydney Smith, he says: "Little stoppages, food pressing in the wrong place, a vext duodenum, and an agitated blind-gut, and there you have 'grouse-disease.'"

In the essay on hate an exposition is given, after Cannon and others, of the part the secretion of the supra-renal capsules plays in "the bodily changes which occur in states of extreme pain, fear, or rage, and serve to place 'un enragé' in an eminently favourable state for wreaking his passion on his opponent." It has been suggested that the use of golden mice in connection with emerods may have implied some awareness of the correlation between rodents (with their fleas) and bubonic plague; Dr. Shipley wonders whether the ancient Hebrews knew anything about the potency of the supra-renal capsules, because they were so very particular in their burnt offerings to offer up "the fat upon the kidneys." We have but one fault to find with this entertaining volume, that it comes to an end too soon.

The Tutorial Chemistry. Part ii., *Metals and Physical Chemistry.* By Dr. G. H. Bailey. Edited by Dr. W. Briggs. Third edition. Pp. viii+460. (London: W. B. Clive, University Tutorial Press, Ltd., 1917.) Price 4*s.* 6*d.*

THE general character of this widely known textbook was described in the review of the first edition which was published in NATURE for April 14, 1898 (vol. lvii., p. 559). In the present issue the second half of the section of the book dealing with physical chemistry has been completely recast by Mr. H. W. Bausor. The whole text has been revised, and the pages concerned with crystallography have been transferred to an appendix.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

The Stability of Lead Isotopes from Thorium.

SINCE my recent letter on the subject of "thorium" lead (NATURE, February 15, p. 469) I have had some correspondence with Dr. Arthur Holmes, who, in agreement with Boltwood, had previously concluded from geological evidence that lead could not be the end product of thorium, because thorium minerals often contain so little lead in comparison with what is to be expected from their age. He pointed out that the age of Ceylon thorite as determined from the ratio of lead to thorium was curiously anomalous. Taking, as preferable, Rutherford's values for the periods of uranium and thorium, 0·72 and 1·9 ($\times 10^{10}$ years) respectively (in the ratio of 1 to 2·6, instead of 3·2, the figure used in the previous letter), the proportion of the thorite lead derived from the thorium would be 95·5 per cent., and from the uranium 4·5 per cent. The quantity of thorium lead per gram of thorium would be 0·0062. The rate of growth would be $4{\cdot}72 \times 10^{-11}$ gram of lead per gram of thorium per year, and the age of the mineral 131 million years. A Ceylon pitchblende (U=72·88 per cent., Pb=4·65 per cent.) has a ratio of lead to uranium of 0·064, giving the age as 512 million years, and Dr. Holmes considers that this is likely to be of the same geological age as the thorite, and to be, of all the Ceylon results, the most trustworthy for age measurements.

It must be remembered that there are two end products of thorium, both being isotopes of lead with the same atomic weight. Thorium-C, an isotope of bismuth, disintegrates dually, 35 per cent. of the atoms expelling first an α and then a β ray, and 65 per cent. first a β and then an α ray. More energy is evolved in the latter mode than in the former, and although the two isotopes have the same atomic mass and the same chemical character, there may be a difference in stability. From analogy with the uranium series, where the same thing is true for radium-C, except that all but a minute fraction of the atoms follow the second mode, it is the 65 per cent. isotope of thorium lead which should further disintegrate, for it is analogous to radium-D.

On the supposition that only the 35 per cent. isotope is stable enough to accumulate, the age of the mineral calculated from the data given would become 375 million years, in nearer agreement with the pitchblende. But the most interesting point is that if we take the atomic weight of the lead isotope derived from thorium as 206·0, and that from thorium as 208·0, and calculate the atomic weight of thorite lead on this basis, we get the same value, 207·74, which I obtained from the density, and Hönigschmid obtained for the atomic weight (207·77).

The question remains, What does the unstable isotope change into? Clearly the rate of change must be excessively slow to account for the apparently complete decay of the radiation of thorium-C. A β or an α ray expelled would result in the production of bismuth or mercury respectively, elements of which I could find no trace in the lead group separated from 20 kilos of mineral. But an α and a β change would produce thallium, which is present in the mineral in amounts that sufficed for chemical as well as spectroscopic identification. On this view, then, this particular lead should give a feeble specific α or β radiation, in addition, of course, to that produced by other lead isotopes present. Circumstances do not permit me to test the

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point, but I understand Prof. Stefan Meyer may be making some examination of the radiations of the material, and the results he obtains will therefore be of very great value in deciding this point.

FREDERICK SODDY.

Aberdeen, May 14.

PROF. SODDY having given me the privilege of reading his letter in advance, I should like to take the opportunity of directing attention to the geological age of the thorium minerals of Ceylon, and to a few further statistics bearing on the suggestion that only 35 per cent. of thorium produces a stable isotope of lead. I am indebted to my friend, Mr. E. J. Wayland, late assistant mineral surveyor of Ceylon, for the following provisional classification (in order of age) of the older rocks of the island:—

(6) Newer pegmatites and quartz reefs.
(5) Welipatanwila series of sediments.
(4) Pyroxenites.
(3) Hornblende, zircon, and other pegmatites of the Balangoda series (source of thorite and thorianite). Galle group, and crystalline limestones (?)
(2) Charnockite series (pyroxene granulites).
(1) Older rocks of the basal complex, including gneisses, with monazite and zircon, pegmatitic secretions, and dioritic intrusions.

This classification clears up much of the mystery in which the thorium minerals of Ceylon have hitherto been shrouded. It was thought at first that they belonged to two distinct periods (Nos. (1) and (3) in the above list), and as the figures in the table given below clearly indicate, the belief was curiously supported by the Pb/U ratios. However, it is now fairly established that thorite and thorianite do not occur in the older rocks of the basal complex, and therefore the higher lead-ratios are misleading for age measurement. The only lead-ratios of any value for this purpose are those of *uraninite* and *zircon*, the former being of the same age as the thorium minerals, while the latter belongs to the pre-Charnockite zirconiferous rocks, and is therefore very much older.

In the following table I have recalculated the lead-ratios on the assumption that 35 per cent. of thorium gives lead as a stable end product; or, in other words, that, weight for weight, thorium produces in any given time only one-seventh as much lead as uranium.

Mineral	Pb per cent.	U per cent.	Th per cent.	Pb/U	Pb/(U+0·14 Th)
Thorianite	2·66	10·4	67·1	0·26	0·133
,,	2·30	11·1	60·3	0·21	0·117
,,	2·10	9·5	63·7	0·22	0·110
,,	2·36	11·4	69·5	0·21	0·110
,,	2·42	12·8	69·4	0·19	0·102
,,	2·76	21·0	44·1	0·23	0·100
Thorite	1·28	4·6	62·8	0·28	0·094
Thorianite	2·78	23·0	55·0	0·121	0·090
,,	2·70	23·8	55·9	0·114	0·085
,,	1·87	13·1	67·3	0·14	0·082
,,	2·16	24·8	54·9	0·087	0·066
,,	2·38	27·8	51·7	0·086	0·066
Thorite	0·78	3·5	59·2	0·22	0·065
,,	0·36	1·62	54·4	0·22	0·045
Average	—	—	—	0·18	0·09
Uraninite	4·65	72·88	7·7	0·064	0·063
Zircon	0·092	0·56	0·01	0·164	0·164

(For references see Proc. Geol. Assoc., vol. xxvi., p. 301, 1915.)

The recalculated ratios approach that of uraninite much more closely than do the simple Pb/U ratios, and thus they support Prof. Soddy's suggestion better than might have been expected from analyses of thorium minerals.

I have elsewhere pointed out the unsuitability of thorium minerals for age determination or correlation, and this is particularly so in the case of minerals from the Palæozoic igneous rocks of Langesundfjord, Norway. Mr. Lawson and myself based our former conclusion that lead could not be the end product of thorium largely on analyses of these minerals. However, I have now recalculated the ratios on the assumption that thorium has one-seventh the lead-producing power of uranium, and it is satisfactory to find that, when thorium is less than five times as abundant as uranium, the ratios agree as closely on this calculation as do the simple lead-ratios. When thorium is more than five times as abundant as uranium neither set of ratios gives any approach to agreement, although the minerals from any one locality agree among themselves. (For the analyses referred to, see *Phil. Mag.*, vol. xxviii., p. 832, 1914; and Proc. Geol. Assoc., vol. xxvi., p. 302, 1915). Thus, having found from experience that the pernicious and irregular behaviour of thorium minerals is apt to be very misleading, I must admit that their evidence is worthless in the absence of atomic weight determinations.

An atomic weight determination by Richards and Lembert on lead from Ceylon thorianite may be used (in the same way as Prof. Soddy has used his own and Hönigschmid's measurements) to test the question of end product. The thorianite referred to contained 60 per cent. Th, and 20 per cent. U, and therefore if the whole of the thorium disintegrated into lead, the atomic weight should be 207·32; whereas if only 35 per cent. of the thorium formed lead, then the atomic weight should be 206·73. Remembering that the presence of original lead is implied by the high lead-ratios of the above table, and that such exogenous lead would raise slightly the latter figure, one finds with pleasure that the atomic weight actually found was 206·82. Prof. Soddy's suggestion thus affords a happy compromise as to the end products of thorium; there is already accumulative evidence in its favour, and as yet there is none against it. In particular it is satisfactory to observe that if the suggestion should receive decisive demonstration, then the estimates of geological time already based on lead-ratios are not appreciably affected.

ARTHUR HOLMES.

Imperial College of Science and Technology, S.W.7,
May 16.

THE SUSPENDED PUBLICATION OF THE "KEW BULLETIN."

WE learn with astonishment that it appears to have been decided to suspend the publication of the *Kew Bulletin*. We say "appears," because it seems almost incredible to anyone with a sense of proportion of the issues involved that such an unfortunate step can really be seriously contemplated. It is, however, announced that the Controller of H.M. Stationery Office (the publisher) has been instructed to form a priority list of printed books and to defer the publication of everything which is not essential, that it has been ruled that the *Kew Bulletin* is not essential, and that its publication has therefore been suspended. It would be of interest to know what steps were taken to enable a considered judgment to be arrived at as regards this useful publication, and to what extent those responsible for its discontinuance are competent to form a just opinion on the merits of what is mainly a technical journal.

The objects served by the *Kew Bulletin* since

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